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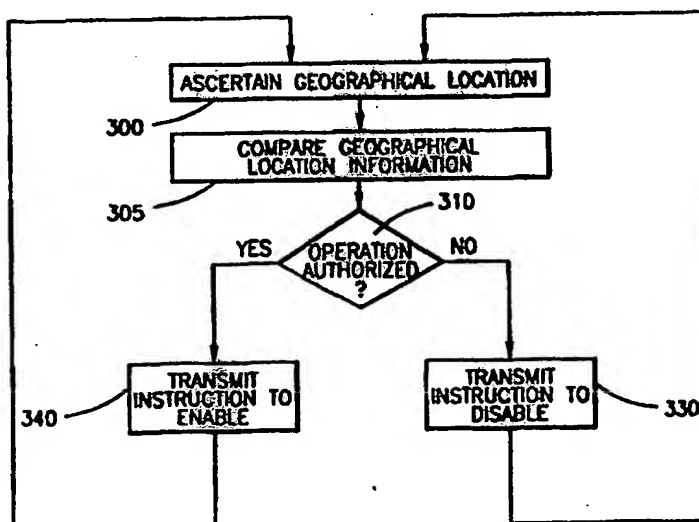
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(71) Applicant: ERICSSON INC. [US/US]; 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC 27709 (US).			
(72) Inventor: VALENTINE, Eric; 1600 Brazos Trail, Plano, TX 75075 (US).			
(74) Agents: MOORE, Stanley, R. et al.; Jenkins & Gilchrist, P.C., Suite 3200, 1445 Ross Avenue, Dallas, TX 75202 (US).			Published With international search report.

(54) Title: NETWORK BASED METHOD AND APPARATUS FOR RESTRICTING OPERATION OF CELLULAR TELEPHONES TO DELINEATED GEOGRAPHICAL AREAS



(57) Abstract

The present invention provides a method and apparatus for restricting operation of a wireless telephone (130) to delineated geographical areas. The wireless telephone system (90) is equipped with a device for ascertaining (step 300) the geographical location of the wireless telephone (130). The ascertained geographical location is compared (step 305) against information pertaining to the authorization to operate the wireless telephone (130) in various geographical locations. A determination is made (step 310) as to whether operation is authorized and the wireless telephone (130) is instructed (step 330) by the wireless telephone system (90) to disable operation if unauthorized.

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NETWORK BASED METHOD AND APPARATUS
FOR RESTRICTING OPERATION OF CELLULAR
TELEPHONES TO DELINEATED GEOGRAPHICAL AREAS

5 CROSS-REFERENCE TO RELATED APPLICATION

 The present application is a continuation-in-part of
co-pending U.S. Application Patent for Serial Number
08/759,997, filed on December 4, 1996, entitled "METHOD
AND APPARATUS FOR RESTRICTING OPERATION OF CELLULAR
10 TELEPHONES TO WELL DELINEATED GEOGRAPHICAL AREAS," by Eric
Valentine and Vladimir Alperovich.

BACKGROUND OF THE INVENTION

Technical Field of the Invention

15 The present invention pertains in general to the
planning and deployment of a wireless telephone system,
and more particularly, to restricting the operation of
wireless telephones to delineated geographical locations
wherein the geographical location of the wireless
20 telephone is ascertained by the wireless telephone system.

Description of Related Art

25 It is often desirable to prohibit operation of
wireless telephones in certain geographical locations.
For example, use of wireless telephones is prohibited in
airplanes while on a runway preparing for take-off.
Operation is also prohibited in areas of hospitals where
wireless telephone transmissions might interfere with life
30 critical equipment. Furthermore, as the service area of
wireless telephone systems grow, such as through the use
of satellite based systems providing national coverage,
it is desirable to prohibit operation in larger
geographical areas such as on military bases.

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It has been proposed to equip wireless telephones with locating devices such as Global Positioning System (GPS) receivers which ascertain the geographical location of the wireless telephone. Service is then denied to mobile stations having an ascertained geographical location within a restricted area. Such systems, however, are expensive and the GPS receiver consumes the limited battery power available to wireless telephones. It would be advantageous therefore, to develop a method and apparatus wherein the wireless telephone system itself ascertains the location of the wireless telephone and controls the disabling of telephone operation when the telephone is located in an unauthorized location.

SUMMARY OF THE INVENTION

A wireless telephone system operates to ascertain the geographical location of wireless telephones. In a satellite based wireless telephone system, the wireless telephone system may ascertain the geographical location through a mapping of the position of the wireless telephone in a satellite reference coordinate system, and then converting the position to an earth reference coordinate system. In another embodiment, the wireless telephone system may ascertain the geographical location through triangulation using a plurality of satellites or base stations which monitor wireless telephone signal transmissions. Regardless of the mechanism used for the system to determine location, a comparison is made between the ascertained geographical location and database information pertaining to authorized/un-authorized geographical locations to determine whether telephone operation is authorized. A controller within the wireless telephone system then instructs the wireless telephone to disable itself when the wireless telephone is determined to be located in an unauthorized location and enable itself when located in an authorized location.

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BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the method and apparatus of the present invention may be acquired by reference to the following Detailed Description when taken in conjunction with the accompanying Drawings wherein:

Figure 1 is a diagram of a satellite based wireless telephone system incorporating the present invention;

Figure 2 is a terrestrial based wireless telephone system incorporating the present invention; and

Figure 3 is a flow diagram of a method for implementing the present invention in a wireless telephone system.

DETAILED DESCRIPTION OF EMBODIMENTS

Referring now to Figure 1, there is illustrated a satellite based wireless telephone system 90 including a plurality of the satellites 100A-C, a terrestrial portion 110 of the wireless telephone system 90, and a database 120. Each of the plurality of satellites 100A-C communicates with the terrestrial portion 110 of the wireless telephone system 90. Although more than one satellite of the plurality of satellites 100A-C may receive transmissions from a wireless telephone 130, typically only one satellite 100A communicates with the wireless telephone 130 at any given time. Communication between the wireless telephone 130 and a public switched telephone network 140 is established via the plurality of satellites 100A-C and the terrestrial portion 110 of the wireless telephone system 90. Also included in the terrestrial portion 110 of the wireless telephone system 90 is a first controller 150 which instructs a second controller 133 within the wireless telephone 130 to disable or enable operation based on the location of the wireless telephone 130.

Several methods are known in the industry for ascertaining the geographical location of a radio transmission source such as the wireless telephone 130.

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For example, in a satellite based wireless telephone system a method known as Satellite To Earth (SATTOE) maps a position of the wireless telephone 130 in a satellite reference coordinate system and then converts the position to an earth reference coordinate system. The satellite to earth mapping operation uses a well known rotation transformation matrix, knowledge of a satellite antenna beam footprint, the position of the satellite, and the communication path of the satellite to determine a rough geographical location of the wireless telephone 130. To obtain the location of the wireless telephone 130 with a higher degree of resolution the satellite to earth mapping operation uses additional information such as the results of calculations performed on a Random Access Channel (RACH) and a Dedicated Control Channel (DCCH). Another well known method to determine the geographical location of the wireless telephone 130 in the satellite based wireless telephone system 90 uses two or more satellites 100A-C to triangulate the geographical location of the wireless telephone 130.

Using any known method, the wireless telephone system 90 ascertains the geographical location of the wireless telephone 130 and accesses the database 120 which contains information pertaining to the authorization to operate the wireless telephone 130 in the ascertained geographical location. Based on a comparison of the information contained in the database 120 against the ascertained geographical location, the first controller 150, which is part of the wireless telephone system 90, determines whether operation is authorized. If operation is unauthorized the first controller 150 transmits a command via the satellite 100 instructing the wireless telephone 130 to disable itself. The second controller 133, located in the wireless telephone 130, receives the command via a transceiver 132 and disables the wireless telephone 130. On the other hand, if operation is authorized the first controller 150, transmits a command via the satellites 100

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instructing the wireless telephone 130 to enable itself. The second controller 133 receives the command via the transceiver 132 and enables the wireless telephone 130.

Referring additionally now to Figure 2, there is illustrated a terrestrial based wireless telephone system 190 including a plurality of base stations 200A-C, a database 120, and a plurality of controllers 250A-C. Each of the plurality of base stations 200A-C communicates with the database 120. Although more than one base station of the plurality of base stations 200A-C may receive transmissions from a wireless telephone 130, typically only one satellite 200A (Figure 1) communicates with the wireless telephone 130 at any given time. Also included in the base stations 200A-C are controllers 250A-C which are capable of instructing the controller 133, located within the wireless telephone 130, to disable and enable operation of the wireless telephone 130.

Several methods are known in the industry for ascertaining the geographical location of the wireless telephone 130 in a terrestrial based wireless telephone communication system. For example, the wireless telephone system can use two or more of the base stations 200A-C to triangulate the geographical location of the wireless telephone 130. Another approach uses knowledge of which base station 200A is communicating with the wireless telephone 130 and Timing Advance (TA) information used in wireless communication between the base station 200A and the wireless telephone 130 to ascertain a rough estimate of the geographical location.

Using any known method, the wireless telephone system 190 ascertains the geographical location of the wireless telephone 130 and accesses the database 120 containing information pertaining to the authorization to operate the wireless telephone 130 in the ascertained geographical location. Based on a comparison of the information contained in the database 120 against the ascertained geographical location, the controller 250A of the base

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station 200A serving the wireless telephone 130 determines whether operation is authorized. If operation is unauthorized the controller 250A, located in the base station 200A, transmits a command instructing the wireless telephone 130 to disable itself. The controller 133, located in the wireless telephone 130, receives the command via the transceiver 132 and disables the wireless telephone 130. On the other hand, if operation is authorized, the controller 250A transmits a command instructing the wireless telephone 130 to enable itself. The controller 133, located in the wireless telephone 130, receives the command via the transceiver 132 and enables the wireless telephone.

Referring additionally now to Figure 3, there is illustrated a flow diagram of a method for implementing the present invention in a wireless telephone system. During operation of the wireless telephone the wireless telephone system periodically ascertains the geographical location of the wireless telephone (step 300). Any known method of ascertaining the geographical location of the wireless telephone can be used including, but not limited to, mapping the position of the wireless telephone in a satellite reference coordinate system to an earth reference coordinate system, or by triangulation using multiple components of the wireless telephone system. Once the geographical location is ascertained, the location is compared against database information pertaining to the authorization to operate in the ascertained location (step 305) and a determination is made as to whether operation is authorized (step 310). If it is determined that operation is unauthorized a controller within the wireless telephone system instructs the wireless telephone to disable itself (step 330). On the other hand, if it is determined that operation is authorized the controller instructs the wireless telephone to continue operation or enable itself if disabled (step 340).

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5 Although embodiments of the method and apparatus of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

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WHAT IS CLAIMED IS:

1. An apparatus for restricting operation of a wireless telephone in a wireless telephone system based on a geographical location of the wireless telephone comprising:

means for ascertaining the geographical location of the wireless telephone, wherein the means is effectuated by the wireless telephone system itself;

a database communicating with the wireless telephone system for storing information pertaining to authorization to operate the wireless telephone in various geographical locations;

means for comparing the ascertained geographical location with database information to determine authorization to operate; and

means for disabling and enabling operation of the wireless telephone based on the determined authorization to operate.

2. The apparatus recited in claim 1, wherein the means for comparing the ascertained geographical location of the wireless telephone comprises a controller, located within a base station of the wireless telephone system, communicating with the database for comparing the ascertained geographical location against database information pertaining to authorization to operate in various geographical locations and determining whether operation is unauthorized or authorized.

3. The apparatus recited in claim 1, wherein the means for disabling and enabling operation of the wireless telephone comprises:

a first controller located within a base station of the wireless telephone system for transmitting a command instructing the wireless telephone to enable or disable operation; and

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a second controller located within the wireless telephone for receiving the command transmitted by the first controller, the second controller enabling the wireless telephone when instructed to enable operation and
5 disabling the wireless telephone when instructed to disable operation.

4. A method for restricting operation of a wireless telephone in a wireless telephone system based on a
10 geographical location of the wireless telephone comprising the steps of:

ascertaining, by the wireless telephone system, the geographical location of the wireless telephone;

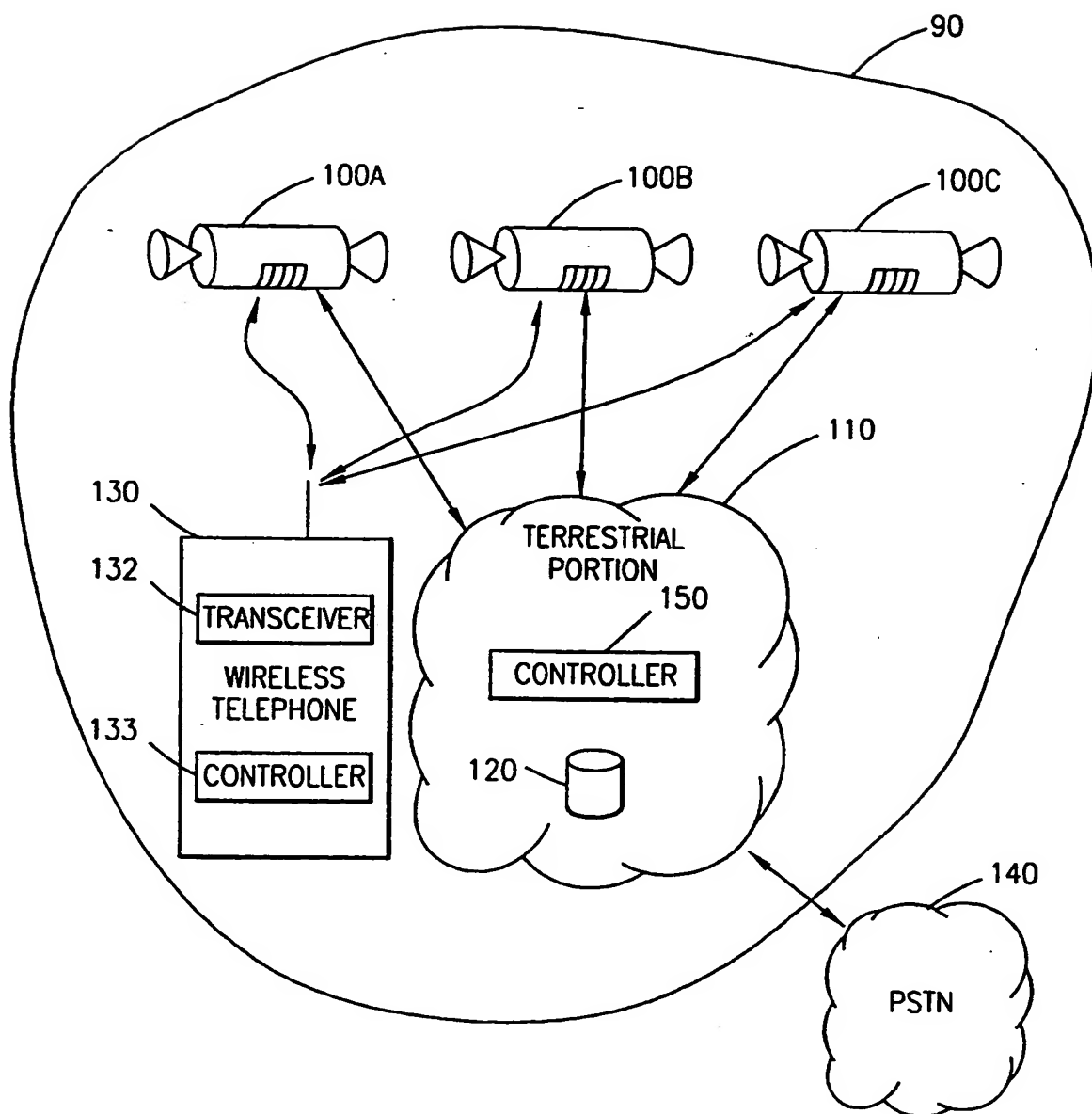
15 comparing, by the wireless telephone, the ascertained geographical location of the wireless telephone to information pertaining the authorization to operate the wireless telephone in various geographical locations;

20 determining, by the wireless telephone system, whether operation of the wireless telephone is allowed in the ascertained geographical location;

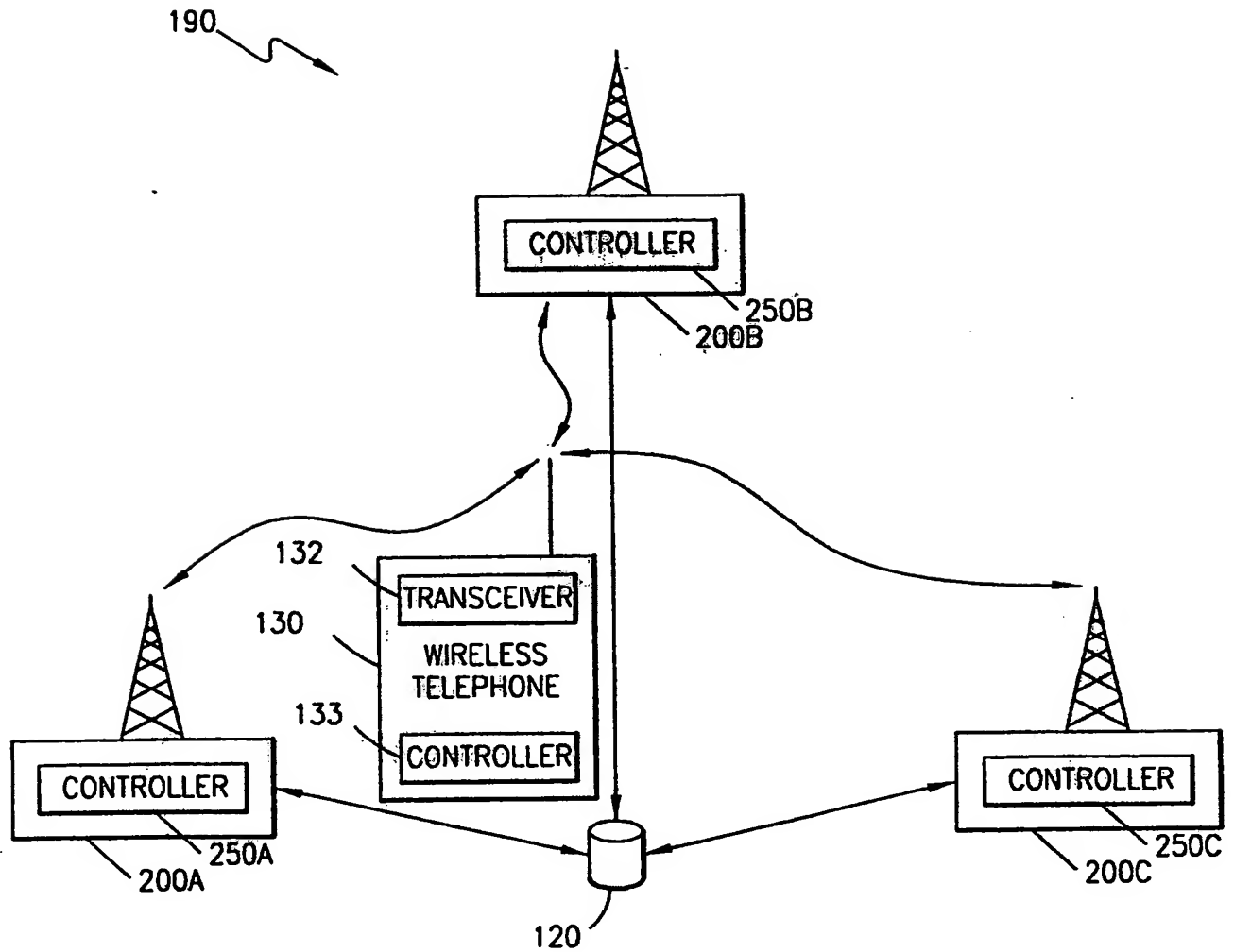
transmitting a command, by the wireless telephone system, instructing the wireless telephone to enable operation in geographical locations where operation
25 is authorized; and

transmitting a command, by the wireless telephone system, instructing the wireless telephone to disable operation in geographical locations where operation is unauthorized.

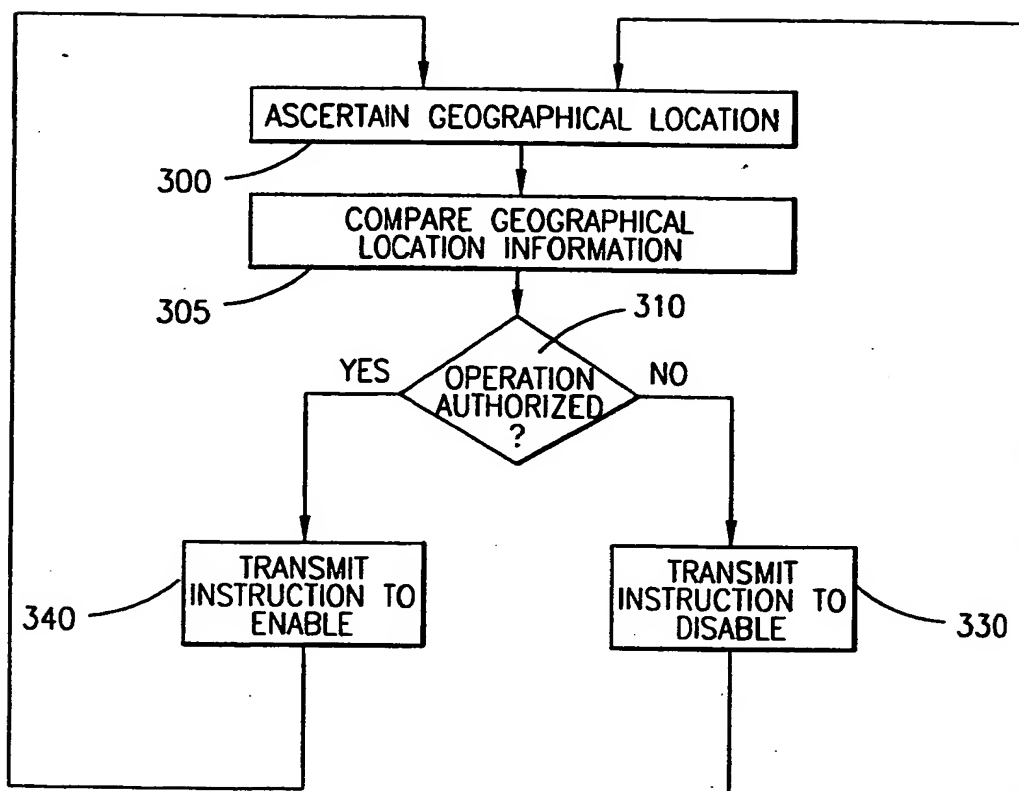
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**FIG. 1**

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**FIG. 2**

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**FIG. 3**

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 98/10777

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H0407/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H040

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 300 787 A (NIPPON ELECTRIC CO) 13 November 1996	1,2
Y	see page 3, line 7 - page 4, line 8 see page 5, line 8 - line 23 see page 6, line 7 - line 15 see page 9 see abstract; claims 1-3; figure 2	3,4
Y	US 5 442 805 A (SAGERS RICHARD C ET AL) 15 August 1995 see column 3, line 61 - column 4, line 34 see abstract; claims 1,5	3,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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US 5442805	A	15-08-1995	AU 4187789 A	01-05-1990
			CA 1317348 A	04-05-1993
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